

# VENTILATION

Trimester Training

# PURPOSE

- Trimester Training is designed to provide training to all firefighters at the company level.

This training will be based on the Lincoln Fire Department operations policies and procedures, IFSTA, essentials, fire protection, publications, NFPA standards or others.

# INTRODUCTION

- All firefighters need to have an understanding of fire department uses both PPV, negative, horizontal, vertical and hydraulic types of ventilation.

This drill is intended to have all personnel review ventilation principles used by the Lincoln Fire Department.

# GOALS

- The firefighter given a presentation on ventilation based on IFSTA Essentials and LFD procedures shall describe knowledge, application and use of ventilation procedures to the satisfaction of the company officer.

# OBJECTIVES

- The firefighter shall define ventilation and explain the advantages and effects of ventilation.
- The firefighter shall identify the safety considerations and precautions to be taken in performing ventilation.
- The firefighter shall describe types of equipment used during ventilation.

# OBJECTIVES

- The firefighter shall describe the advantages and disadvantages of the following types of ventilation.
  - a ) vertical
  - b ) horizontal
  - c ) trench/strip
  - d ) mechanical
  - e ) mechanical pressurization
  - f ) hydraulic

# OBJECTIVES

- Picture Ventilation BK. Pg. 9
- Picture of a backdraft

The firefighter shall identify the signs, causes and effects of backdraft explosions.  
The firefighter shall identify methods of preventing a backdraft explosion.

# OBJECTIVES

- Picture Essentials of FF IV pg. 355
- Picture of roof types- show both

The firefighter shall recognize the characteristics of, and list necessary precautions when ventilating the following roof types:

- ) flat
- ) pitched
- ) arched
- ) shed

# OBJECTIVES

- The firefighter shall determine the integrity of a roof system by sounding.
- The firefighter shall describe how the following factors are used to determine the integrity of a roof system:
  - a ) construction
  - b ) visual observation
  - c ) elapsed time of fire

# OBJECTIVES

- The firefighter shall define procedures for the following types of ventilation:
  - a ) vertical
  - b ) horizontal
  - c ) trench/strip
  - d ) mechanical
  - e ) mechanical pressurization
  - f ) hydraulic

# OBJECTIVES

- Essentials of FF IV pg. 372, 373
- Essentials of FF III pg. 186
- Ventilation BK pg. 39, 59, 71
- Any of these pictures will work

The firefighter shall explain opening various types of windows from inside and outside, with and without the use of tools.

The firefighter shall explain breaking window or door glass and removing obstructions.

The firefighter using both hand and power tools, shall demonstrate the ventilation for pitched and flat roofs.

# OBJECTIVES

- The firefighter shall identify considerations that must be made when determining the location and size of a ventilation opening including.
  - a ) availability of natural openings
  - b ) location of fire
  - c ) direction in which the fire will be drawn
  - d ) type of building construction
  - e ) wind direction
  - f ) progress of fire

# OBJECTIVES

- g ) condition of the building
- h ) obstructions
- i ) relative efficiency of large vs. small openings
- The firefighter shall identify the location of the opening, the method to be used, and the precautions to be taken when ventilating a basement

# VENTILATION

- Picture Ventilation BK pg. 23

Ventilation is the systematic removal of heated air, smoke and gases from a structure, followed by the replacement of a supply of cooler air, which facilitates other firefighting priorities.

# ADVANTAGES OF VENTILATION

- A) Aids lifesaving and rescue operations
- B) Speeds fire attack and extinguishment
  - Makes firefighting easier
  - Permits easier salvage operations
- C) Property conservation
  - Reduces fire and water damage
  - Reduces smoke and heat damage
- D) Fire spread control
  - Reduces mushrooming

# ADVANTAGES OF VENTILATION

- Helps provide confinement

E ) Reduction of flashover potential

F ) Reducing the danger of backdraft

- Proper ventilation at highest point, this removes unburned carbon and heat, then the addition of oxygen will not complete the fire triangle

# ADVANTAGES OF VENTILATION

- Picture Essentials of FF III pg. 211

## Signs of possible backdraft

- ) Puffing/sucking/or curling smoke
- ) Windows rattling
- ) Yellowish-gray-greenish smoke
- ) Windows darkened/thick smoke inside
- ) Exterior walls and doors hot to touch
- ) Hot unbroken glass
- ) Dull orange flame or no visible flame
- ) High temperature
- ) Tight building

# PROCEDURES FOR DETERMINING VENTILATION NEEDS

## A ) Life safety Hazards

- Establish need - Hazards
- Use most desirable method

## B ) Fire protection requirements and precautions.

- Exposures
- Have charged hose lines in place
- Provide secondary means of escape

# PROCEDURES FOR DETERMINING VENTILATION NEEDS

- Picture Ventilation BK pg. 88
- Picture shows weak areas and strong areas.

Prevent personnel from walking on spongy roofs to help distribute weight of firefighters

) If necessary-lay ladder on roof to help distribute weight of firefighter

Secure lifeline to firefighter working on roof to protect from sliding or falling

Watch out for electrical wires

# PROCEDURES FOR DETERMINING VENTILATION NEEDS

## C) Dangers when performing ventilation

- Dense smoke
- Toxic gases
- Low oxygen
- Flammable or combustible gases
- Structural damage or weakness
- Large volume of fire
- Backdraft/flashovers

# PROCEDURES FOR DETERMINING VENTILATION NEEDS

## D) Ventilation Procedures

- Location and extent of fire
- When to ventilate
- What method of ventilation needed

## ) Ventilation Procedures

### Location and extent of fire

Construction features- trusses

High- rise buildings

Basement and windowless buildings

Contents

Exposures

Wind direction

### When to ventilate

Determined upon heat, smoke, gas, and buildup

When location of fire is known

### What method of ventilation needed

Horizontal

Vertical

Forced (negative or positive)

# TOP OR VERTICAL VENTILATION

- Picture Ventilation BK pg. 97
- Picture showing FF removing skylight

Selecting the place to ventilate

Availability of natural openings or installed ventilating devices.

Skylights- should be removed not broken

Ducts or Vents

Scuttles- are metal/wooden hatches that provide access into a attic or cockloft

Stairway doors

Location of fire, and the direction you want the fire to travel

# TOP OR VERTICAL VENTILATION

- Picture Ventilation BK pg. 118
- Picture showing ventilation using K-12

Type of construction (various roof types and tools used to ventilate them)

Flat- sloped- mansard

Axe, chain saw, pike pole, ladders, and/or K-12 saw

Pitched- gable, hip or gambrel

Axe, chain saw, pike pole, ladders, and/or K-12 saw

Arched

Axe, chain saw, pike pole, aerial ladder or snorkel preferred, and k-12 saw

# TOP OR VERTICAL VENTILATION

- Picture Ventilation Bk pg. 105
- Picture showing FF venting roof using chain saw and axe for a foothold

## Concrete

Power K-12 saw (concrete blade), jack hammer, use existing openings

## Metal deck

Axe, K-12 saw (metal blade), ladder

## Tiles/slate roofs

Sledge hammer, axe, K-12 saw

## Trench or strip ventilation

## Basement fires

# TOP OR VERTICAL VENTILATION

- Picture Ventilation BK pg. 131
- Shows order in which to make cuts

## Ventilating a roof

Sound roof for supports with axe

Mark location of opening with pickhead

Consider removing building or roofing

Cut along roof support

Use short strokes- order of cut

Make all cuts before clearing opening pry up all roof material with pickhead or other tool to clear opening

May need to push long handled tool down through opening to remove ceiling

NEVER carry power saws up a ladder while the saw is running (K-12 or Chain saw) s

# TOP OR VERTICAL VENTILATION

- Wind direction
- The extent of fire progress
- Condition of building and contents

# TOP OR VERTICAL VENTILATION

- Top level ventilation procedures
  - Coordinating with attack and ground crews
  - Observe wind direction relating to the exposures
  - Note the existence of obstructions or weights on the roof
  - Secure a lifeline to the roof
  - Utilize natural roof openings

# TOP OR VERTICAL VENTILATION

- Picture Essentials of FF III pg. 223
- Pictures of one large ventilation hole rather than several small ones

Cut one large hole rather than several small ones

4' x 4' for residential

8' x 8' for commercial

Make hole at highest point of the building or directly over the fire

Work with the wind at your back

Push down the ceiling

Follow safety precautions

# TOP OR VERTICAL VENTILATION

- Precautions (upsetting vertical ventilation)
  - DON'T put water into the vent opening
  - Improper use of forced ventilation
  - Excessive glass breakage
  - Explosions
  - Breakage of skylights
  - Hole burning through
  - Other openings between the attack team and upper openings

# CROSS OR HORIZONTAL VENTILATION PROCEDURES

## A) Where used

- Residence where attic is not involved
- Buildings with high windows
- Attic with louvers
- Floors of multi- storied structures
- Buildings with large unsupported open spaces under the roof

# CROSS OR HORIZONTAL VENTILATION PROCEDURES

## B) Weather

- Open leeward window at highest point first
- Open windward window at lowest point second

## C) Exposures

- People
- Buildings

# CROSS OR HORIZONTAL VENTILATION PROCEDURES

## D) Precautions (upsetting horizontal ventilation)

- Opening doors and windows, on windward first may cause an upset of thermal layering
- Opening doors and windows between firefighting crews and exists

## E) Provide charged hose line

# CROSS OR HORIZONTAL VENTILATION PROCEDURES

## F ) Using windows for ventilation

- Remember “TRY BEFORE YOU PRY”
- Types of windows:
  - 1 )Checkrail or Double hung
    - pry at center of lower sash
    - note this may break glass
  - 2 )Casement or hinged
    - Difficult to enter due to latching mechanism and crank
  - 3 )Projected and factory
    - Breaking pane at latch and open window

# CROSS OR HORIZONTAL VENTILATION PROCEDURES

## 4 )Awning or jalousie

- Awning has larger panes of glass
- Jalousie has narrow panes of glass avoid going through if possible
- When breaking glass
  - Ordinary glass relatively inexpensive
  - Tempered glass should be broken only as a last resort

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# CROSS OR HORIZONTAL VENTILATION PROCEDURES

- Picture Ventilation BK pg. 71
- FF breaking glass with axe

## Things to remember:

Stay on windward side

Keep hands above point of impact

Start at top of pane and work down

Remain to side of opening so fire gases can escape

Clear all jagged glass from frame

LOOK for signs of backdraft

# CROSS OR HORIZONTAL VENTILATION PROCEDURES

- Picture Ventilation BK pg. 70
- Picture of natural cross ventilation showing how far windows should be opened

Open top on leeward, bottom on windward

Open 2/3 from top, 1/3 from bottom if windows only on one side

Remove all obstructions

Screens

Curtains

Coordinate with attack crew

Sometimes opening windows is sufficient, but often they must be broken for fast through ventilation

# MECHANICAL VENTILATION FORCED

## A) Fog Stream- Hydraulic Ventilation

- Stream expansion
- Entrainment of gases and smoke
- Use 60% fog pattern and cover 85-90% of the window opening and approximately two feet from the window (inside to outside)

# MECHANICAL VENTILATION FORCED

B) Smoke Ejectors- Negative Pressure  
Ventilation

– Pull don't push air

# MECHANICAL VENTILATION FORCED

## C) Positive Pressure Ventilation (PPV)

- Using fan from outside of the structure to blow fresh air into the building

# MECHANICAL VENTILATION

## – Advantages

- Keeps firefighters out of smoke
- Doesn't block entrances or exits
- Can expel smoke out of voids by the pressure it creates
- Requires less setup time
- More efficient
- Weather usually doesn't affect it

## – Disadvantages

- Can cause fire to intensify
- Dependent on a power source
- Requires special equipment

# HVAC EFFECTS ON BUILDING VENTILATION

(Heating, Ventilation, and Air  
Conditioning)

- Precautions
  - If the (HVAC) doesn't shut off it may cause smoke and fire to spread

# VENTILATION THE "3 NEVERS"

- A) Never ventilate before hose lines are in position and charged
- B) Never put a hose into vent opening
- C) Picture Ventilation BK pg. 67

# Ventilation Trimester

- Name/ID \_\_\_\_\_
- Date \_\_\_\_\_
- Rig/Shift \_\_\_\_\_
- Captains Signature \_\_\_\_\_

1. The firefighter discusses or demonstrates positive pressure ventilation. Y \_\_\_\_\_  
N \_\_\_\_\_
2. The firefighter discusses the advantages and disadvantages of positive and negative pressure ventilation. Y \_\_\_\_\_ N \_\_\_\_\_
3. The firefighter demonstrates horizontal, vertical, hydraulic and strip ventilation.  
Y \_\_\_\_\_ N \_\_\_\_\_
4. The firefighter discusses the different equipment required for the different types of ventilation. Y \_\_\_\_\_ N \_\_\_\_\_